[0017] FIG. **7**C is a representation of the turbofan engine of FIG. **7**A equipped with another exemplary embodiment of a bypass air valve of the present disclosure;

[0018] FIG. **7**D is a representation of the turbofan engine of FIG. **7**A equipped with another exemplary embodiment of a bypass air valve of the present disclosure;

[0019] FIGS. **8**A-**8**D are representations of the means for selectively actuating the bypass air valve of the present disclosure in various stages of actuation;

[0020] FIG. **9** is another representation of the means for selectively actuating the bypass air valve of the present disclosure;

[0021] FIG. **10** illustrates how the exemplary liner disclosed herein achieves acceptable fan stall margin and fan flutter margin during fan operation without the use of variable fan duct stream nozzle area;

[0022] FIG. **11** illustrates a reduction in liner pressure ratio that results with increasing the bypass air valve flow;

[0023] FIG. **12** illustrates how the available liner pressure ratio may be influenced by thermodynamic cycle selection to increase the potential for bypass air valve flow; and

[0024] FIG. **13** illustrates how the selection of the location where fan duct stream air enters the turbine exhaust stream may be used to increase the static pressure ratio controlling bypass air valve flow for a given total pressure ratio, thereby increasing the potential for bypass air valve flow.

[0025] Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0026] Referring now to FIGS. **6** and **7**A-**7**D, a single stage, high bypass ratio turbofan engine **10** may be described as having a gas turbine engine nacelle **11** having disposed within a fan **12**, a compressor section **14**, a combustor **16**, a turbine section **18**, a bypass air valve **20**, a bypass fan duct nozzle **22** and a turbine exhaust nozzle **24**, all disposed concentrically about a centerline **30** of the engine **10**. Air exiting the fan **12** is divided between the turbine exhaust stream flow **26** and fan exhaust stream flow **28**. Turbine exhaust stream flow **26** follows a path through the compressor section **14**, combustor **16**, turbine section **18**,and turbine exhaust nozzle **24** in that order. Turbine exhaust stream flow **26** may, therefore, be described as following a path substantially parallel to the centerline **30**. Fan exhaust stream flow **28** also follows a path parallel to the centerline **30**, but instead flows through the fan bypass duct **32** and exits the fan bypass duct nozzle **22**. A transfer flow **36** is transferred from the fan exhaust stream flow **28** to the turbine exhaust stream flow **26** through the bypass air valve **20**. Selection of the thermodynamic cycle for the engine **10** and the location selected for the transfer of fan exhaust stream flow **28** to the turbine exhaust stream flow **26** can be established so that the transfer flow **36** is at a higher pressure than a pressure of the turbine exhaust stream flow **26** at a flow transfer location **34**. Generally, the flow transfer location is the location where the transfer of the fan exhaust stream flow to the turbine engine exhaust stream flow takes place. Various flow transfer locations are illustrated in FIGS. **7**A-**7**D.

[0027] As illustrated in FIG. **6**, the bypass air valve **20** may comprise a substantially circular shaped liner **40** having at least one aperture(s) **42** and at least one impermeable region **44**. The phrase “substantially circular shape” means a shape able to be concentrically disposed about a turbofan engine component such as, but not limited to, a fan bypass duct, a turbine exhaust case, a turbine exhaust nozzle, a bypass air valve support, any component located between the fan bypass duct and turbine exhaust nozzle, and the like.

[0028] Referring again to FIGS. **7**A-**7**D, the bypass air valve **20** may be installed at any location from between the fan bypass duct **32** to the turbine exhaust stream nozzle **24**. In FIG. **7**A, the bypass air valve may be concentrically disposed about an interior surface **31** of the fan bypass duct **32**. In FIG. **7**B, the bypass air valve may be concentrically disposed about an exterior surface **33** of the turbine exhaust case **35**, and the interior surface **31** includes a plurality of apertures **37** described further below. In FIG. **7**C, the bypass air valve **20** may be concentrically disposed about an exterior surface **25** of the turbine exhaust nozzle **24** and between the exterior surface **25** and an interior surface **23** of a core nacelle **21** of the nacelle **11**. The core nacelle **21** is the portion of the nacelle **11** extending from the combustor section **16** to the turbine exhaust nozzle **24**. And, the interior surface **31** includes a plurality of apertures **37** described further below. FIG. **7**D illustrates how the bypass air valve **20** may be concentrically disposed about any surface at a location from between the fan bypass duct **32** to the turbine exhaust nozzle **24**. For example, surfaces such as surfaces **25**, **33** include an area having at least one aperture **37** that are located in a position to either align with at least one aperture **42** or at least one impermeable region **44** of the liner **40** of the bypass air valve **20**. The alignment of the apertures **42** and apertures **37** create the aforementioned flow transfer that enters the exhaust stream flow at location **34**. In the alternative, a bypass air valve structure **45** may be disposed at a location from between the fan bypass duct **32** to the turbine exhaust stream nozzle **24**. The bypass air valve structure **45** is designed to support the bypass air valve **20**, provide a surface area **47** having at least one aperture **37** as described above, and provide separation between the fan exhaust flow stream and the turbine exhaust stream flow.

[0029] The means for selectively actuating the liner **40** may comprise a means for selectively circumferentially actuating **48** the liner **40** about a turbine engine component, or a means for selectively axially actuating the liner **40** about the turbine engine component along the centerline **30**. The means for selectively axially actuating the liner **40** axially about the turbine engine component along the centerline **30** may comprise any type of actuating device capable of such movement as known to one of ordinary skill in the art. A representative means for selectively circumferentially actuating **48** the liner **40** circumferentially may comprise as the mechanism disclosed in U.S. Pat. No. 5,775,098 to Philippona, assigned to United Technologies Corporation, which is incorporated by reference herein in its entirety, and illustrated herein at FIGS. **8**A-**8**D and **9**. The range of motion of actuation, whether actuating circumferentially or axially, may be determined by the distance between the apertures **37** of the turbine engine component with respect to the apertures **42** and impermeable regions **44** of the liner **40**. For example, the liner **40** may be actuated axially a distance sufficient, e.g., in inches (millimeters) to substantially align the apertures **37** of the turbine engine component with the apertures **42** or impermeable regions **44**. Likewise, the liner **40** may be actuated circumferentially a distance, e.g., in degrees (radians), sufficient to substantially align the apertures **37** of the turbine engine component with the apertures **42** or impermeable regions **44**.

[0030] Referring now to FIGS. **8**A-**8**D and **9**, the means for selectively circumferentially actuating **48** is shown. The means for selectively circumferentially actuating **48** may be